The use of the large spatial coherence of turbulence patterns for predicting observing conditions in astronomical observatories

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Seeing and scintillation have been monitored simultaneously with identical instruments during several nights at two astronomical observatories in Chile: Las Campanas and La Silla, distant of a few tens of kilometers in the direction of the prevailing wind. The good correlation of the signals shows that turbulence in the atmosphere conserves its features over long distances. The analysis of their relative time of occurrence permits to determine the direction and speed of propagation of the turbulence layers either in the atmospheric boundary layer or in the higher troposphere.

These properties may be used for predicting, a few hours in advance, observing conditions at modern ground based astronomical observatories as an input to a knowledge based telescope scheduler during flexible operation.

A feasibility study is underway at ESO, as part of the development of the VLT Astronomical Weather Station (AWS), using Differential Image Motion Monitors (DIMM), small aperture scintillometers, and a 3D Acoustic sounder (SODAR).